BCSE103E -
Computer Programming: Java

Digital Assignment – 3

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1. Shapes

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

// Circle class
class Circle {
    public double radius;

    public double area() {
        return Math.PI * radius * radius;
    }

    public double perimeter() {
        return 2 * Math.PI * radius;
    }

    public double circumference() {
        return perimeter();
    }
}

// Rectangle class
class Rectangle {
    public double length;
    public double breadth;

    public double area() {
        return length * breadth;
    }

    public double perimeter() {
        return 2 * (length + breadth);
    }

    public boolean isSquare() {
        return length == breadth;
    }
}

// Square class
class Cylinder {
    public double radius;
    public double height;

    public double lidArea() {
        return Math.PI * radius * radius;
```

```
    }

    public double circumference() {
        return 2 * Math.PI * radius;
    }

    public double totalSurfaceArea() {
        return 2 * lidArea() + circumference() * height;
    }

    public double volume() {
        return lidArea() * height;
    }
}

// Main class
public class Shapes {
    public static void main(String[] args) {
        // Circle
        Circle c = new Circle();
        c.radius = 5;
        System.out.println("Circle");
        System.out.println("Area: " + c.area());
        System.out.println("Perimeter: " + c.perimeter());
        System.out.println("Circumference: " + c.circumference());
        System.out.println();

        // Rectangle
        Rectangle r = new Rectangle();
        r.length = 5;
        r.breadth = 10;
        System.out.println("Rectangle");
        System.out.println("Area: " + r.area());
        System.out.println("Perimeter: " + r.perimeter());
        System.out.println("Is Square: " + r.isSquare());
        System.out.println();

        // Cylinder
        Cylinder cy = new Cylinder();
        cy.radius = 5;
        cy.height = 10;
        System.out.println("Cylinder");
        System.out.println("Lid Area: " + cy.lidArea());
        System.out.println("Circumference: " + cy.circumference());
        System.out.println("Total Surface Area: " + cy.totalSurfaceArea());
        System.out.println("Volume: " + cy.volume());
    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
$  cd c:\\Dhruv\\VIT\\Semester-3\\Java\\Lab\\DA-3 ; /usr/bin/er
de\\User\\workspaceStorage\\a4c2414d105e96dcb9002913c66454d8\\r
Circle
Area: 78.53981633974483
Perimeter: 31.41592653589793
Circumference: 31.41592653589793

Rectangle
Area: 50.0
Perimeter: 30.0
Is Square: false

Cylinder
Lid Area: 78.53981633974483
Circumference: 31.41592653589793
Total Surface Area: 471.23889803846896
Volume: 785.3981633974483
```

2. Student marks

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

class Student {
    public String name;
    public int rollNo;
    public String course;
    public int m1, m2, m3;

    public int total() {
        return m1 + m2 + m3;
    }

    public float average() {
        return (float) total() / 3;
    }

    public char grade() {
        if (average() >= 60) {
            return 'A';
        } else {
            return 'B';
        }
    }

    public String details() {
        return "Name: " + name + "\nRoll No: " + rollNo + "\nCourse: " +
course + "\nMarks: " + m1 + ", " + m2 + ", "
                + m3 + "\nTotal: " + total() + "\nAverage: " + average() +
"\nGrade: " + grade();
    }

    public String toString() {
        return details();
    }
}

public class Marks {
    public static void main(String[] args) {
        Student s1 = new Student();
        s1.name = "Dhruv";
        s1.rollNo = 0611;
        s1.course = "B.Tech";
        s1.m1 = 99;
        s1.m2 = 88;
```

```
        s1.m3 = 98;

        // Printing details by calling details() method
        System.out.println(s1.details());
        System.out.println();

        // Printing details by calling toString() method
        System.out.println(s1);

    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main
$  cd c:\\Dhruv\\VIT\\Semester-3\\Java\\Lab\\DA-3 ; /us
v\\AppData\\Roaming\\Code\\User\\workspaceStorage\\a4c2
Name: Dhruv
Roll No: 393
Course: B.Tech
Marks: 99, 88, 98
Total: 285
Average: 95.0
Grade: A

Name: Dhruv
Roll No: 393
Course: B.Tech
Marks: 99, 88, 98
Total: 285
Average: 95.0
Grade: A
```

3. Exercise 1 (Bank account, Television, car classes)

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

// Bank account class
class BankAccount {
    public String name;
    public int accountNo;
    public double balance;

    public void deposit(double amount) {
        balance += amount;
    }

    public void withdraw(double amount) {
        if (amount > balance) {
            System.out.println("Insufficient balance");
        } else {
            balance -= amount;
        }
    }

    public void transfer(BankAccount other, double amount) {
        if (amount > balance) {
            System.out.println("Insufficient balance");
        } else {
            balance -= amount;
            other.balance += amount;
        }
    }

    public String toString() {
        return "Name: " + name + "\nAccount No: " + accountNo + "\nBalance: "
+ balance;
    }
}

// Telivision class
class Television {
    public String brand;
    public int size;
    public int volume;
    public int chanNo;
    public boolean isSmart;

    public void turnOn() {
```

```
        System.out.println("Turning on the TV");
    }

    public void turnOff() {
        System.out.println("Turning off the TV");
    }

    public void changeChannel(int ch) {
        chanNo = ch;
        System.out.println("Changing channel to " + chanNo);
    }

    public void changeVolume(int v) {
        volume = v;
        System.out.println("Changing volume to " + volume);
    }

    public String toString() {
        return "Brand: " + brand + "\nSize: " + size + "\nIs Smart: " +
isSmart;
    }
}

// Car class
class Car {
    public String brand;
    public String model;
    public int year;
    public int speed;

    public void start() {
        System.out.println("Starting the car");
    }

    public void stop() {
        System.out.println("Stopping the car");
    }

    public void accelerate(int s) {
        speed += s;
        System.out.println("Accelerating to " + speed);
    }

    public void brake(int s) {
        speed -= s;
        System.out.println("Braking to " + speed);
    }
```

```
    public String toString() {
        return "Brand: " + brand + "\nModel: " + model + "\nYear: " + year;
    }
}

// Main class
public class Exercise1 {
    public static void main(String[] args) {

        // Bank account
        System.out.println("Bank account");
        BankAccount acc1 = new BankAccount();
        acc1.name = "Dhruv Shah";
        acc1.accountNo = 123456789;
        acc1.balance = 10000;
        System.out.println(acc1);

        acc1.deposit(1000);
        System.out.println(acc1);
        acc1.withdraw(5000);
        System.out.println(acc1);
        acc1.transfer(acc1, 1000);
        System.out.println(acc1);
        System.out.println();

        // Television
        System.out.println("Television");
        Television tv1 = new Television();
        tv1.brand = "Samsung";
        tv1.size = 32;
        tv1.volume = 10;
        tv1.chanNo = 1;
        tv1.isSmart = true;
        System.out.println(tv1);

        tv1.turnOn();
        tv1.changeChannel(5);
        tv1.changeVolume(15);
        tv1.turnOff();
        System.out.println();

        // Car
        System.out.println("Car");
        Car car1 = new Car();
        car1.brand = "Lamborghini";
        car1.model = "Veneno";
        car1.year = 2014;
        car1.speed = 0;
```

```
        System.out.println(car1);

        car1.start();
        car1.accelerate(100);
        car1.brake(50);
        car1.stop();
    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
$  cd c:\\Dhruv\\VIT\\Semester-3\\Java\\Lab\\DA-3 ; /usr/bin/env C:\\P
v\\AppData\\Roaming\\Code\\User\\workspaceStorage\\a4c2414d105e96dcb90
Bank account
Name: Dhruv Shah
Account No: 123456789
Balance: 10000.0
Name: Dhruv Shah
Account No: 123456789
Balance: 11000.0
Name: Dhruv Shah
Account No: 123456789
Balance: 6000.0
Name: Dhruv Shah
Account No: 123456789
Balance: 6000.0

Television
Brand: Samsung
Size: 32
Is Smart: true
Turning on the TV
Changing channel to 5
Changing volume to 15
Turning off the TV

Car
Brand: Lamborghini
Model: Veneno
Year: 2014
Starting the car
Accelerating to 100
Braking to 50
Stopping the car
```

4. Access modifiers and read and write methods (Set and get)
   CODE

```java
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

class PrivateRectangle {
    private double length;
    private double breadth;

    public double getLength() {
        return length;
    }

    public double getBreadth() {
        return breadth;
    }

    public double getArea() {
        return length * breadth;
    }

    public double getPerimeter() {
        return 2 * (length + breadth);
    }

    public void setLength(double length) {
        if (length > 0) {
            this.length = length;
        } else {
            this.length = 0;
        }
    }

    public void setBreadth(double breadth) {
        if (breadth > 0) {
            this.breadth = breadth;
        } else {
            this.breadth = 0;
        }
    }

    public boolean isSquare() {
        return length == breadth;
    }
}
```

```java
public class AccessModifiers {
    public static void main(String[] args) {
        PrivateRectangle r1 = new PrivateRectangle();
        r1.setLength(10);
        r1.setBreadth(10);
        System.out.println("Length: " + r1.getLength());
        System.out.println("Breadth: " + r1.getBreadth());
        System.out.println("Area: " + r1.getArea());
        System.out.println("Perimeter: " + r1.getPerimeter());
        System.out.println("Is Square: " + r1.isSquare());
    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
$  /usr/bin/env C:\\Program\ Files\\Java\\jdk-11.0.11\\bin\\ja
\\a4c2414d105e96dcb9002913c66454d8\\redhat.java\\jdt_ws\\DA-3_
Length: 10.0
Breadth: 10.0
Area: 100.0
Perimeter: 40.0
Is Square: true
```

5. Constructors (Default, parameterized and constructor overloading for rectangle and cylinder)

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

// Rectangle class
class ConstructorRectangle {
    public double length;
    public double breadth;

    // Default constructor
    public ConstructorRectangle() {
        length = 0;
        breadth = 0;
    }

    // Parameterized constructor
    public ConstructorRectangle(double length, double breadth) {
        this.length = length;
        this.breadth = breadth;
    }

    // Overloading constructor
    public ConstructorRectangle(double side) {
        length = side;
        breadth = side;
    }

    public void setBreadth(double breadth) {
        this.breadth = breadth;
    }

    public void setLength(double length) {
        this.length = length;
    }

    public double getBreadth() {
        return breadth;
    }

    public double getLength() {
        return length;
    }
```

```
    public double area() {
        return length * breadth;
    }

    public double perimeter() {
        return 2 * (length + breadth);
    }

    public boolean isSquare() {
        return length == breadth;
    }
}

// Cylinder class
class ConstructorCylinder {
    public double radius;
    public double height;

    // Default constructor
    public ConstructorCylinder() {
        radius = 0;
        height = 0;
    }

    // Parameterized constructor
    public ConstructorCylinder(double radius, double height) {
        this.radius = radius;
        this.height = height;
    }

    // Overloading constructor
    public ConstructorCylinder(double radius) {
        this.radius = radius;
        height = 0;
    }

    public void setRadius(double radius) {
        this.radius = radius;
    }

    public void setHeight(double height) {
        this.height = height;
    }

    public double getRadius() {
        return radius;
    }
```

```
    public double getHeight() {
        return height;
    }

    public double lidArea() {
        return Math.PI * radius * radius;
    }

    public double drumArea() {
        return 2 * Math.PI * radius * height;
    }

    public double circumference() {
        return 2 * Math.PI * radius;
    }

    public double totalSurfaceArea() {
        return 2 * lidArea() + circumference() * height;
    }

    public double volume() {
        return lidArea() * height;
    }
}

public class Constructor {
    public static void main(String[] args) {
        // Rectangle
        System.out.println("Rectangle");
        ConstructorRectangle r1 = new ConstructorRectangle();
        ConstructorRectangle r2 = new ConstructorRectangle(10, 20);
        ConstructorRectangle r3 = new ConstructorRectangle(10);

        System.out.println("Area of r1: " + r1.area());
        System.out.println("Perimeter of r1: " + r1.perimeter());
        System.out.println("Is r1 a square: " + r1.isSquare());
        System.out.println();

        System.out.println("Area of r2: " + r2.area());
        System.out.println("Perimeter of r2: " + r2.perimeter());
        System.out.println("Is r2 a square: " + r2.isSquare());
        System.out.println();

        System.out.println("Area of r3: " + r3.area());
        System.out.println("Perimeter of r3: " + r3.perimeter());
        System.out.println("Is r3 a square: " + r3.isSquare());
        System.out.println();
```

```
        System.out.println("----------------------------------------");

        // Cylinder
        System.out.println("Cylinder");
        ConstructorCylinder c1 = new ConstructorCylinder();
        ConstructorCylinder c2 = new ConstructorCylinder(10, 20);
        ConstructorCylinder c3 = new ConstructorCylinder(10);

        System.out.println("Lid area of c1: " + c1.lidArea());
        System.out.println("Drum area of c1: " + c1.drumArea());
        System.out.println("Circumference of c1: " + c1.circumference());
        System.out.println("Total surface area of c1: " +
c1.totalSurfaceArea());
        System.out.println("Volume of c1: " + c1.volume());
        System.out.println();

        System.out.println("Lid area of c2: " + c2.lidArea());
        System.out.println("Drum area of c2: " + c2.drumArea());
        System.out.println("Circumference of c2: " + c2.circumference());
        System.out.println("Total surface area of c2: " +
c2.totalSurfaceArea());
        System.out.println("Volume of c2: " + c2.volume());
        System.out.println();

        System.out.println("Lid area of c3: " + c3.lidArea());
        System.out.println("Drum area of c3: " + c3.drumArea());
        System.out.println("Circumference of c3: " + c3.circumference());
        System.out.println("Total surface area of c3: " +
c3.totalSurfaceArea());
        System.out.println("Volume of c3: " + c3.volume());
        System.out.println();
    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
$  cd c:\\Dhruv\\VIT\\Semester-3\\Java\\Lab\\DA-3 ; /usr/bin/env C:\\Program\ Files\\Jav
v\\AppData\\Roaming\\Code\\User\\workspaceStorage\\a4c2414d105e96dcb9002913c66454d8\\red
Rectangle
Area of r1: 0.0
Perimeter of r1: 0.0
Is r1 a square: true

Area of r2: 200.0
Perimeter of r2: 60.0
Is r2 a square: false

Area of r3: 100.0
Perimeter of r3: 40.0
Is r3 a square: true

---------------------------------------
Cylinder
Lid area of c1: 0.0
Drum area of c1: 0.0
Circumference of c1: 0.0
Total surface area of c1: 0.0
Volume of c1: 0.0

Lid area of c2: 314.1592653589793
Drum area of c2: 1256.6370614359173
Circumference of c2: 62.83185307179586
Total surface area of c2: 1884.9555921538758
Volume of c2: 6283.185307179587

Lid area of c3: 314.1592653589793
Drum area of c3: 0.0
Circumference of c3: 62.83185307179586
Total surface area of c3: 628.3185307179587
Volume of c3: 0.0
```

6. Exercise 2 (Product and customer classes)

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

// Product class
class Product {
    private int itemNo;
    private String name;
    private double price;
    private int quantity;

    // Default constructor
    public Product() {
        itemNo = 0;
        name = "";
        price = 0;
        quantity = 0;
    }

    // Parameterized constructor
    public Product(int itemNo, String name, double price, int quantity) {
        this.itemNo = itemNo;
        this.name = name;
        this.price = price;
        this.quantity = quantity;
    }

    public void setPrice(double price) {
        this.price = price;
    }

    public void setQuantity(int quantity) {
        this.quantity = quantity;
    }

    public int getItemNo() {
        return itemNo;
    }

    public String getName() {
        return name;
    }

    public double getPrice() {
        return price;
    }
```

```
    public int getQuantity() {
        return quantity;
    }
}

// Customer class
class Customer {
    private int custId;
    private String name;
    private String address;
    private String phoneNo;

    // Default constructor
    public Customer() {
        custId = 0;
        name = "";
        address = "";
        phoneNo = "";
    }

    // Parameterized constructor
    public Customer(int custId, String name, String address, String phoneNo) {
        this.custId = custId;
        this.name = name;
        this.address = address;
        this.phoneNo = phoneNo;
    }

    public void setAddress(String address) {
        this.address = address;
    }

    public void setPhoneNo(String phoneNo) {
        this.phoneNo = phoneNo;
    }

    public int getCustId() {
        return custId;
    }

    public String getName() {
        return name;
    }

    public String getAddress() {
        return address;
    }
```

```
    public String getPhoneNo() {
        return phoneNo;
    }

    public String toString() {
        return "Customer ID: " + custId + "\nName: " + name + "\nAddress: " +
address + "\nPhone Number: " + phoneNo;
    }
}

// Main class
public class Exercise2 {
    public static void main(String[] args) {
        // Create a product object
        Product product = new Product(1, "Laptop", 50000, 1);

        // Create a customer object
        Customer customer = new Customer(1, "Dhruv", "Mumbai", "1234567890");

        // Print the details of the product
        System.out.println("Product Details:");
        System.out.println("Item Number: " + product.getItemNo());
        System.out.println("Name: " + product.getName());
        System.out.println("Price: " + product.getPrice());
        System.out.println("Quantity: " + product.getQuantity());

        // Print the details of the customer
        System.out.println("\nCustomer Details:");
        System.out.println(customer);

        // Update the price and quantity of the product
        product.setPrice(60000);
        product.setQuantity(2);

        // Update the address and phone number of the customer
        customer.setAddress("Pune");
        customer.setPhoneNo("0987654321");

        // Print the updated details of the product
        System.out.println("\nUpdated Product Details:");
        System.out.println("Item Number: " + product.getItemNo());
        System.out.println("Name: " + product.getName());
        System.out.println("Price: " + product.getPrice());
        System.out.println("Quantity: " + product.getQuantity());

        // Print the updated details of the customer
        System.out.println("\nUpdated Customer Details:");
```

```
        System.out.println(customer);

    }
}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
$  /usr/bin/env C:\\Program\ Files\\Java\\jdk-11.0.11\\bin\\java.exe -
\\a4c2414d105e96dcb9002913c66454d8\\redhat.java\\jdt_ws\\DA-3_b95285c7
Product Details:
Item Number: 1
Name: Laptop
Price: 50000.0
Quantity: 1

Customer Details:
Customer ID: 1
Name: Dhruv
Address: Mumbai
Phone Number: 1234567890

Updated Product Details:
Item Number: 1
Name: Laptop
Price: 60000.0
Quantity: 2

Updated Customer Details:
Customer ID: 1
Name: Dhruv
Address: Pune
Phone Number: 0987654321
```

7. Exercise 3 (Marks in subject)

CODE

```
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

class Subject {
    private String subId;
    private String name;
    private int maxMarks;
    private int marksObtained;

    public Subject(String subId, String name, int maxMarks) {
        this.subId = subId;
        this.name = name;
        this.maxMarks = maxMarks;
    }

    public String getSubId() {
        return subId;
    }

    public String getName() {
        return name;
    }

    public int getMaxMarks() {
        return maxMarks;
    }

    public int getMarksObtained() {
        return marksObtained;
    }

    public void setMarksObtained(int marksObtained) {
        this.marksObtained = marksObtained;
    }

    public void setMaxMarks(int maxMarks) {
        this.maxMarks = maxMarks;
    }

    boolean isQualified() {
        return marksObtained >= (maxMarks * 0.4);
    }

    public String toString() {
```

```
        return "Subject ID: " + subId + "\nSubject Name: " + name + "\nMaximum
Marks: " + maxMarks
                + "\nMarks Obtained: " + marksObtained + "\nPassed: " +
isQualified() + "\n";
    }
}

public class Exercise3 {
    public static void main(String[] args) {
        Subject sub1 = new Subject("CS101", "Computer Programming", 100);
        Subject sub2 = new Subject("CS102", "Data Structures", 100);
        Subject sub3 = new Subject("CS103", "Discrete Mathematics", 100);

        sub1.setMarksObtained(80);
        sub2.setMarksObtained(70);
        sub3.setMarksObtained(30);

        System.out.println(sub1);
        System.out.println(sub2);
        System.out.println(sub3);

    }

}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (ma
$  cd c:\\Dhruv\\VIT\\Semester-3\\Java\\Lab\\DA-3 ; /
v\\AppData\\Roaming\\Code\\User\\workspaceStorage\\a4
Subject ID: CS101
Subject Name: Computer Programming
Maximum Marks: 100
Marks Obtained: 80
Passed: true

Subject ID: CS102
Subject Name: Data Structures
Maximum Marks: 100
Marks Obtained: 70
Passed: true

Subject ID: CS103
Subject Name: Discrete Mathematics
Maximum Marks: 100
Marks Obtained: 30
Passed: false
```

8. Static and final members and blocks

CODE

```java
// JAVA DA - 3
// by Dhruv Rajeshkumar Shah
// 21BCE0611

class StaticCar {
    // Static variable
    static long carCount = 0;

    // Final variable
    final long CARID = 100002343;

    // Static block
    static {
        System.out.println("Static block called");
    }

    // Constructor
    StaticCar() {
        carCount++;
    }

    // Static method
    static void printCarCount() {
        System.out.println("Number of cars: " + carCount);
    }

    // Final method
    final void printCarId() {
        System.out.println("Car ID: " + CARID);
    }
}

public class Static {
    public static void main(String[] args) {
        StaticCar.printCarCount();
        StaticCar car1 = new StaticCar();
        StaticCar car2 = new StaticCar();
        StaticCar car3 = new StaticCar();
        StaticCar.printCarCount();
        car1.printCarId();
        car2.printCarId();
        car3.printCarId();
    }

}
```

OUTPUT

```
dhruv@Titan /c/Dhruv/VIT/Semester-3/Java/Lab/DA-3 (main)
\\bin Static ppData\\Roaming\\Code\\User\\workspaceStorage\\a4c2414c
Static block called
Number of cars: 0
Number of cars: 3
Car ID: 100002343
Car ID: 100002343
Car ID: 100002343
```